

Summary of Hanford 55 and 85 Hz Noise Lines

STAMP-PEM

May 15, 2014

On April 18th, We see some high power in several PEM channels at both 55 and 85 Hz, all located in around the same place. Coherence is especially strong for the 55Hz line. Some were magnetometer channels. It should be noted that this was not necessarily the earliest incident of these lines necessarily but the date of these runs.

1 57 Hz Line

1.1 Plastic On

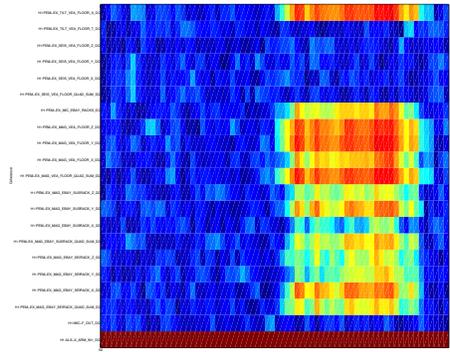
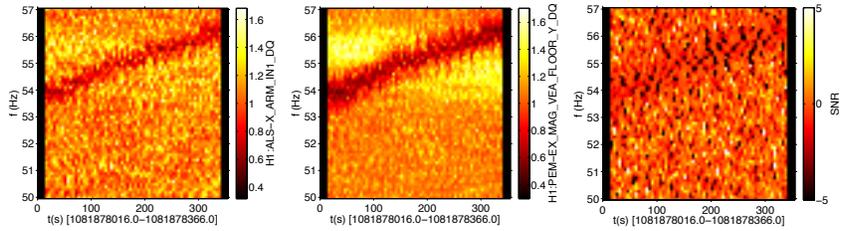


Figure 1: Coherence Matrix displaying coherence as a function of frequency for a set of channels (on the left) cross-correlated with the X-Arm of the Hanford detector. Frequency runs from 45-60Hz on the x-axis.

1.2 Plastic Off

Plastic was then placed on top of the I/O box under the assumption that varying power drawn by the cooling fan over its cycle, which uses the same power source as the digitizer, could be causing this. Adding a load to the fan should decrease



(a) Power in x-arm channel (b) Power in one of the magnetometer channels (c) Cross-power SNR spectrum

its frequency. when plastic was added to the I/O box we still saw coherence but at a lower frequency:

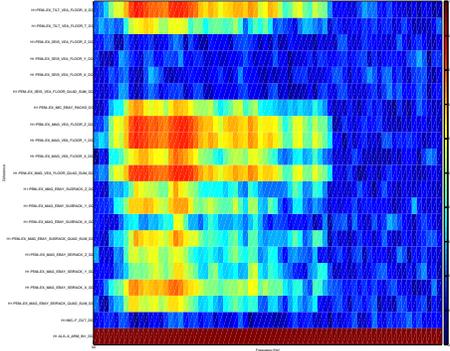
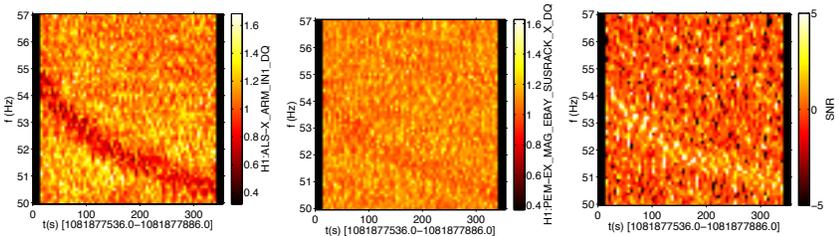


Figure 2: Coherence Matrix for X-Arm again but with plastic on. We see a shift down in frequency here

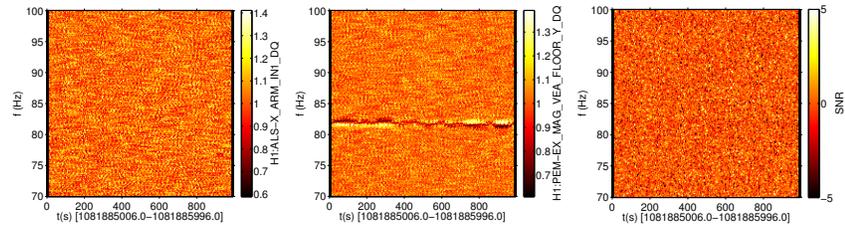


(a) Power in X-Arm Channel (b) Power in one of the magnetometer channels (c) Cross-power SNR spectrum

section85Hz lines
 We also see lines show up in the power for these same PEM channels at 85 Hz with the plastic off and 80Hz with the plastic on. The coherence matrix

doesn't show strong coherence (a lighter line at 79.10Hz) but the power in the magnetometer channels does show up clearly. Examples can be found below.

1.3 Plastic Off



(d) Power in X-Arm Channel (e) Power in one of the magnetometer channels (f) Cross-power snr spectrum

Figure 3: Diagnostic plots for plastic off case. We see a line at 83Hz or so. While it doesn't appear coherent (see plot below for slight bump) we do see high power in the magnetometer channel. Note that frequency range here is 70-100 Hz throughout.

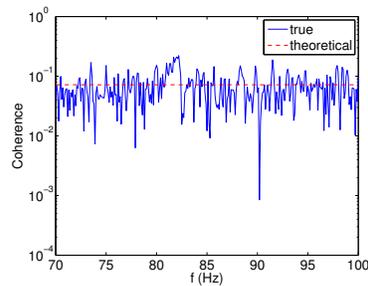


Figure 4: Coherence spectrum only for the magnetometer channels shown in Fig. (3) with the X-arm and no plastic on the fan. We see a slight bump at 82-83Hz but nothing on the order of the 0.8-0.9 value of coherence for the 55Hz case. The power is there in the PEM nonetheless.

1.4 Plastic On

With the plastic on we do see a slight coherence line at 79.1Hz as shown in Fig. (5).

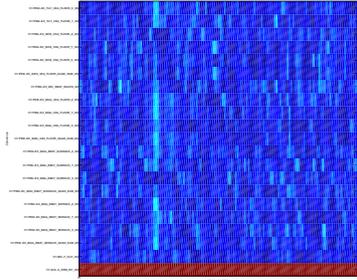
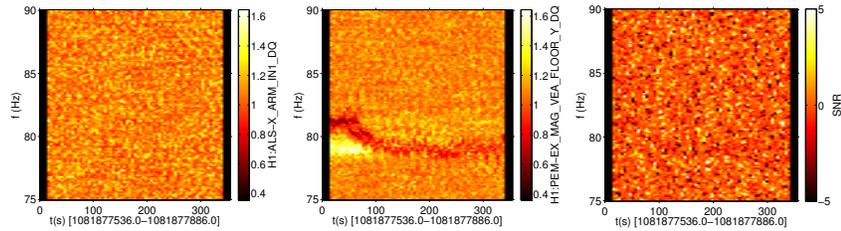


Figure 5: Coherence matrix with plastic on. Slight line around 79.1 Hz but certainly not nearly as coherent as the 50-57 Hz lines shown above.

From here we can look at the diagnostic plots and see a loud power line in the magnetometer, but not necessarily showing up in the X-Arm cavity.



(a) Power in X-Arm Channel (b) Power in one of the magnetometer channels (c) Cross-power snr spectrum

Figure 6: STAMP plots for plastic on the fan. Note that frequency range here is 75-90 Hz throughout.

2 Summary

It's clear that adding the plastic resulted in a downward shift at least at these GPS times (UTC time on right for April 18th, 2014).

	Start GPS	End GPS	Start UTC	Start UTC
Plastic On	1081877563	1081877883	17:32:27	17:37:47
Plastic Off	1081885006	1081886006	19:36:30	19:53:10